

Next Generation Weather Radar (NEXRAD)

Bob Saffle: April 13, 1999

The NEXRAD system (also known as Weather Surveillance Radar - 1988 Doppler) is one of NOAA's prime observation systems for acquiring information about meteorological conditions, and is also one of the key systems in NOAA's modernization and restructuring. By using Doppler radar technology, forecasters can observe the presence of precursor conditions of severe weather such as tornadoes, large hail and damaging thunderstorm winds. NEXRAD allows for the detection of wind circulation patterns (e.g., mesocyclones) as precursors to tornadic activity and provides data on the direction and speed of tornado cells once they form. NEXRAD also provides quantitative estimates of precipitation, which are important in forecasting flash floods, main stream river flooding and in water resource management. The severe weather and storm wind field detection capabilities offered by NEXRAD have contributed to a significant increase in the accuracy and timeliness of NWS warnings. The advantages of NEXRAD over conventional radars can be broken down into five basic areas: improved sensitivity, improved resolutions, wind velocity estimation, automated data collection in three dimensions, and capability for scientific processing of data.

The benefits of this system will continue to be improved through scientific advances in the use of weather radar data, and through improved processing and data dissemination capabilities. A NEXRAD Product Improvement (NPI) Program has been established to plan and implement these continued improvements. The primary goal of the NPI Program is to modify, augment and improve upon the existing capabilities of the NEXRAD system so it can support, in a cost-effective and timely manner, known operational requirements, as well as those requirements that can reasonably be anticipated.

The NWS is currently implementing two major upgrades to the NEXRAD system: the Open Systems Radar Product Generator (ORPG) and the Open Systems Radar Data Acquisition (ORDA). ORPG will be deployed in the calendar year 2000-2002 time frame. ORDA is scheduled for deployment in the 2002-2004 time frame. The deployment of ORPG will enable the NWS to implement many additional scientific products and to support better communications capabilities, including dissemination of base data as required. ORDA deployment will enable improvements in data quality, including mitigation of range folding, also known as 'purple haze.'

Work is also underway to develop and test a dual polarization capability for NEXRAD. Dual polarization is a radar signal transmission, reception and processing scheme that provides information on the relative height and width of precipitation targets. Significant improvements are anticipated in estimating the amount of rainfall and identifying precipitation types such as rain, snow and hail. If the development and testing validate the promise of dual polarization, it will be deployed in the 2005-2008 time frame.

NEXRAD Product Improvement: Open Systems Rehost

Workshop for NWS Partners

**Robert E. Saffle
NWS Office of Systems Development
Silver Spring, Maryland
Robert.Saffle@noaa.gov**

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NEXRAD Product Improvement Mission

◆ Overall Mission

- S To improve severe weather warnings**
- S To continually evolve WSR-88D system to avoid need for wholesale replacement**

◆ Current NPI Project

- S To rehost the WSR-88D from the existing, proprietary computer platform to an open systems, standards based COTS workstation platform**
 - ◆ To take advantage of advances in hydrometeorological science and technology**
 - ◆ To maintain cost effective operations**

Potential Future Applications for Open RPG

- ◆ **High Resolution Data Array Products for AWIPS, WARP...**
- ◆ **Incorporation of Environmental Data**
- ◆ **Rapid Update of Algorithm Output**
 - S Virtual volume updated with each completed elevation scan
 - S VIL, TDA, SCIT, HDA, DDPDA
 - S Likely ready for ORPG Build 2
- ◆ **Multiple PRF Dealiasing Algorithm**
 - S Developed from 1995-1997 by NSSL and now in real-time test
 - S Reduces range folding and velocity dealiasing errors
 - S Likely ready for ORPG Build 2

Potential Future Applications for Open RPG (concluded)

- ◆ **Boundary Detection**
- ◆ **Snow Algorithm**
- ◆ **New VCPs**
- ◆ **Vortex Detection and Diagnosis Algorithm**
- ◆ **BWER Detection**
- ◆ **Data Quality Algorithms**
- ◆ **Incorporation of FAA Radars: TDWR, ASR-9, ARSR-4**
- ◆ **Dual Doppler Analyses**
- ◆ **High Resolution Vertical Layers, i.e., CAPPIs**

Potential Future Applications for Open RDA

- ◆ **Sophisticated Techniques for Mitigating Range and Velocity Folding**
- ◆ **Provision of Additional Base Data**
 - S **1/4 Kilometer Reflectivity**
 - S **Velocity Beyond 230 KM**
 - S **Reflectivity Data From Doppler Scans**
 - S **Velocity Data From Surveillance Scans**
 - S **Reflectivity with Nationally-constant Clutter Filters**
 - S **Pseudo-moments of SNR and Other QC Data**
- ◆ **Support for Addition of Dual Polarization Capability**

NPI Schedule

